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MALTA FEVER IN SOUTHWESTERN UNITED STATES.

WITH SPECIAL REFERENCE TO A RECENT OUTBREAK IN PHOENIX, ARIZ.

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The first case of Malta fever known to have originated in the United States was reported in 1905 by Col. C. F. Craig,¹ Medical Corps, United States Army. The patient was a nurse who contracted the disease in Washington, D. C., probably from nursing infected soldiers. Craig also reported nine other cases occurring in soldiers returned from the Philippines. In this report he stated that he was convinced that Malta fever existed in the warmer portions of the United States. This statement can scarcely be classed as a prediction that it would be found to exist, but is rather a conservative opinion based on a careful study of the disease and the knowledge that conditions favorable to its existence and spread were present in the warmer portions of the United States.

Six years later, Ferenbaugh,² Medical Corps, United States Army, reported five cases of Malta fever in Texas, the first cases of the indigenous occurrence of this disease in the United States. All five had worked with goats and had drunk goat's milk. Following this report, Ferenbaugh and Gentry, Medical Corps, United States Army, were detailed by the Surgeon General of the Army to make some field investigations of the disease in Texas. Their investigations, reported in 1911,³ show that Malta fever had in all probability been present in Texas at that time for at least 25 years. They made serological tests on 128 goats and found 19.4 per cent positive for Malta fever; but, because of the unfavorable time of year for such work, were unable to isolate *B. melitensis* from any of the goats. They made positive diagnoses, by serological tests, on seven human cases in addition to the five first reported by Ferenbaugh. In two of these cases they recovered *B. melitensis*. They point out that the favorable

¹ Craig, Charles F.: The Symptomatology and Diagnosis of Malta Fever, with the Report of Additional Cases. Internat. Clinics, 15th series, vol. 4: 89-115.

² Ferenbaugh, Thos. L.: Endemic Mediterranean Fever in Southwest Texas. Jour. Am. Med. Assn., 57: 730.

³ Gentry, Ernest R., and Ferenbaugh, Thos. L.: Endemic Malta Fever in Texas. Jour. Am. Med. Assn., 57: 889. Ibid, 57: 1045. Ibid, 57: 1127.

time to study the disease is during the spring and early summer, during which time the goats are kidding and are in full milk, and not in the fall, at which time their investigations were made.

Yount and Looney,⁴ in 1912, reported five cases of Malta fever, all occurring in persons connected with the goat industry, near Wagoner, Ariz. Yount,⁵ in 1913, reported an additional case in which he isolated *B. melitensis*, and four other cases occurring in the practice of Dr. J. C. Wilson at Wilcox, Ariz., two of which were positive by agglutination tests made by Capt. C. L. Cole, Medical Corps, United States Army, at Fort Sam Houston, Tex.

During the summer of 1922 the first outbreak of Malta fever in any city in the United States occurred in Phoenix, Ariz. The outbreak resulted from the sale of goat's milk by a high-class dairy, whereas practically all of the indigenous cases previously reported in this country were directly connected with the goat-raising industry. More than 30 cases were positively diagnosed, and doubtlessly many others occurred. Two fatalities resulted in patients already more or less invalidated by other infections. This series of cases constitutes the first, in one locality, of sufficient size to warrant being called an epidemic. It was the privilege of the writer to be detailed to Arizona to cooperate with the State and local authorities in the investigation of Malta fever in Phoenix in particular, and of its occurrence in the State in general. The important facts obtained in connection with the Phoenix outbreak are briefly as follows:

Cases of a peculiar febrile disease began to appear in Phoenix about the middle of May, 1922, in which a variety of provisional diagnoses, including typhoid fever, rheumatic fever, malaria, septicemia, and influenza, were made. After several weeks Malta fever was suspected, following which cultures of *B. melitensis* were secured from the Hygienic Laboratory, United States Public Health Service. Agglutination tests made at the Pathological Laboratory of Phoenix, on August 3, and confirmed later by the Hygienic Laboratory, established beyond doubt the presence of Malta fever in the city. The fact that the presence of Malta fever was not recognized earlier is an indication of the difficulties attending its early recognition.

By the end of September, 35 cases had been located, most of which had probably been infected before the end of June. In September a number of these cases were sufficiently typical clinically to warrant a diagnosis of Malta fever, even in the absence of a known source of infection, or of positive serological tests. Temperature records could be secured in only 12 of the cases, 9 of which showed the wave-like effect, from which the name "undulant fever" was first given

⁴ Yount, C. E., and Looney, R. N.: Malta Fever in Arizona, with a Preliminary Report of Cases. South Calif. Pract. 27: 257.

⁵ Yount, C. E.: Malta Fever in the United States. Military Surgeon, 33: 540.

the disease by Hughes, and the other 3 were not inconsistent. The length of time that the fever lasted varied from 60 days to more than 150 days; one or two of the cases are, at this writing, still febrile. The cases varied in severity from ambulatory to fatal. However, of the two patients who died, one was a chronic case of tuberculosis and the other had probably suffered from some type of focal infection. All the cases, with the exception of one patient who objected to having blood taken, were positive for Malta fever by the agglutination test. It is interesting to note, too, that their serums caused an agglutination of *B. abortus* (Bang) equally as well. *B. melitensis* was recovered from two of the cases.

The investigations showed that all but three of the patients had drunk goat's milk supplied from the same dairy, and that the possibility of these three having drunk of this milk also could not be excluded. This milk was placed on sale April 7, 1922. Our investigations showed that nearly all the patients were probably infected by June 1, although the sale of the goat's milk was not stopped until August 3, 1922. The explanation for this is that the milk sold came from two different herds of goats, which for convenience are designated as herd A and herd B. Up to about June 1 all of the goats' milk used came from herd A; soon after that time the milk from herd A was mixed more or less with milk from herd B and finally almost or entirely replaced by it. Agglutination tests made on serums from 115 of the goats from herd A gave 18.3 per cent positives. Gentry and Ferenbaugh (*loc. cit.*), in Texas, found 19.4 per cent of positives in 128 goats examined. Serums from 143 goats from herd B gave only two positives. It seems quite probable that herd B was free from infection when brought down from the hills early in the spring and became infected from herd A. We are particularly indebted to the Bureau of Animal Industry for collecting most of the goat serums. The herd A goats were on the range during the writer's stay in Phoenix, and it was impracticable to obtain their serums until they were rounded up for shearing. Dr. M. Shipley, veterinary inspector, stationed at Phoenix, kindly volunteered to secure the serums for us at that time.

From information obtained from Arizona State and local authorities and various physicians, we are certain that Malta fever has occurred in several widely separated areas of the State. We wish especially to mention a series of five cases, all in the same family, occurring near Phoenix in 1908, as they constitute the first that occurred in the State in which we could get a history. These cases were attended by Dr. H. K. Beauchamp, and from his account of them, and an almost classical description of his own illness and that of the others obtained first hand from one of the patients, we are convinced that these cases were Malta fever and that the disease has

been present in Arizona at least 14 years. Two of the other four cases had left the State, but are known to be in good health. One died in 1909, probably from the disease, and one was killed in the late war. It is of interest to note that two of them, after suffering with the disease for several months in Arizona, being told by their physician that they might have tuberculosis, and believing that they were in the last stages, "went back home to die," one to Missouri the other to Oklahoma; but instead of dying, both recovered completely after about six months.

GENERAL CONSIDERATIONS.

From the investigations of Gentry and Ferenbaugh, Malta fever has existed in Texas for at least 36 years, and, from our own, it has existed in Arizona for at least 14 years. Tests made on goats in both States have shown an infection of representative herds of nearly 20 per cent. The same subtropical climate, together with numerous goat herds, exists from Texas to the Pacific coast. It is well known that goats are shipped, or are driven, back and forth between the Southwestern States and into other States as well. Whether infected goats will continue to have Malta fever and spread the same when shipped from our Southern States with subtropical climates to Northern States has not been investigated; but from the researches of Mohler and Hart ⁶ it is altogether probable that they will. With these conditions present, we are convinced that Malta fever must exist in New Mexico and California. There is no doubt that it exists in Mexico; at least one case developing in Mexico was studied by Woolsey ⁷ in St. Louis in 1918.

Goat's milk is being sold at the present time in a number of cities in the United States, usually as a fancy article and at a high price. It is consumed largely by infants and invalids, particularly by patients with tuberculosis, and in these persons Malta fever could exist for a long time without being recognized. Some of the Phoenix cases were patients with quiescent tuberculosis, fever-free for months. These cases, with a Malta-fever infection superimposed, behaved as cases in which tuberculosis had suddenly become active, and, in the absence of an epidemic, would never have been diagnosed without the most careful observation. The difficulty in recognizing so insidious a disease in infants needs no comment.

SUMMARY.

1. Malta fever has, in all probability, existed in Texas for at least 36 years and in Arizona for at least 14 years. Absolutely authentic cases have been known in Texas since 1911 and in Arizona since 1912.

⁶ Mohler, John R., and Hart, Geo. H.: Malta Fever and the Maltese Goat Importation. 25th Annual Report, B. A. I., 1908, 279-295.

⁷ Woolsey, Russ. A.: Missouri Med. Assn. 15:165.

2. Conditions favorable for the existence and spread of Malta fever are present in all the Southwestern States.

3. More than 30 authentic cases of Malta fever occurred in the recent outbreak at Phoenix, Ariz., concerning which the following can be stated:

(a) These cases were typical clinically and serologically; and in two cases *B. melitensis* was recovered.

(b) Goat's milk is known to have been used in all but three of the cases and can not be excluded in those three.

(c) Tests made on the goats supplying this milk gave 18.3 per cent positives for Malta fever.

(d) The disease remained unrecognized for at least six weeks, under conditions unusually favorable for its recognition.

4. Goat's milk is being sold in a number of cities in the United States.

CONCLUSIONS.

From the evidence at hand we believe the following conclusions are warranted:

1. Malta fever is probably endemic in certain sections of the southwestern part of the United States and in some parts of Mexico.

2. It is extremely difficult to recognize Malta fever early in the course of an outbreak, from the clinical symptoms alone; usually the possibility of its presence is not considered, and laboratory tests are not made for some weeks.

3. The prohibition of the sale of goat's milk in cities where an ample supply of cow's milk is available should be seriously considered by health officers. Where it is necessary to allow the sale of goat's milk to secure sufficient fresh milk, efficient pasteurization under constant supervision by the health authorities should be required.

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MORTALITY FROM CANCER IN THE UNITED STATES, 1921.

The Department of Commerce announces that the returns compiled by the Bureau of the Census show that over 76,000 deaths were due to cancer in the death registration area of the United States in 1921, and, assuming that the remainder of the United States had as many deaths from this cause in proportion to the population, the total number of deaths from cancer in the entire United States for